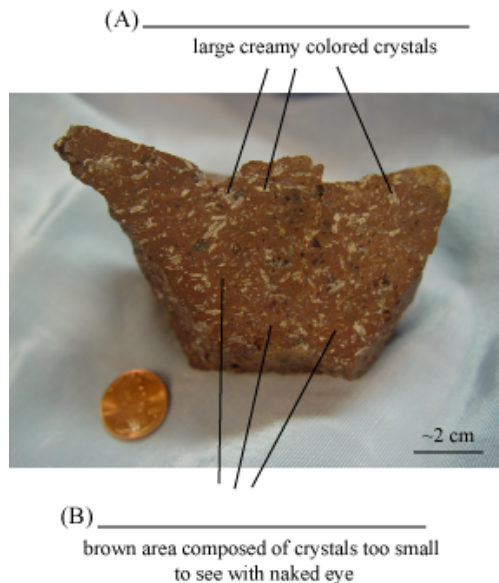


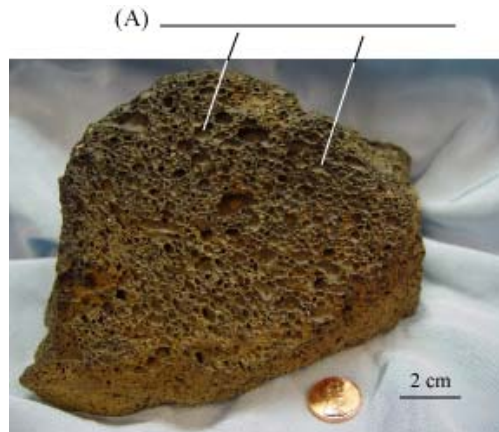
Igneous Rocks – Practice Exams and Answers

Revised August 2007

1. Silicate liquids existing beneath the Earth's surface are called _____.
2. Silicate liquids that flow out at the Earth's surface or seabed are called _____.
3. Intrusive igneous rocks form from the crystallization and consolidation of _____.
4. Extrusive igneous rocks form from the crystallization and consolidation of _____ or the eruption and accumulation of _____ material.
5. The intrusive compositional equivalent of rhyolite is _____.
6. The extrusive compositional equivalent of gabbro is _____.
7. The intrusive compositional equivalent of andesite is _____.
8. An intrusive igneous rock composed of crystals that are large enough to see with the naked eye is said to exhibit a _____ texture.
9. An extrusive igneous rock composed of crystals that are so small that you can not detect them with the naked eye is said to exhibit an _____ texture.
10. Below is a photograph of a piece of rock collected from a solidified lava flow. What kind of texture is displayed? Please write in the blank labels the technical terms for the large creamy colored crystals (A) and the brown areas (B) that are composed of crystals that are too small to detect with just the naked eye.



11. The general term for fragmental material erupted from a volcano is _____.
12. From the following list what item represents the size class composed of the largest pyroclastic material?
(A) Bombs/Blocks
(B) Ash
(C) Lapilli
13. How do blocks differ from bombs?
14. Air-fall deposits are produced by _____ falling from the sky.
15. When ash is lithified it is called _____.
16. Lapilli tuff contains particles ranging from _____ and _____ mm in size.
17. Ash is less than _____ mm in size.
18. In the following illustration, label (A) points to holes or voids in an extrusive igneous rock. Please place in the blank label the technical term for these holes or voids which were the former sites of gas bubbles.



19. How does scoria differ from pumice?

20. What would you call the name of the glassy black rock shown below? Hint: It has been used in the past to make arrow heads.



21. According to the United States Geological Survey, the term pyroclastic flow refers to a ground-hugging mixture of ash, pumice, rock fragments, and hot gas that rushes down the side of a volcano at speeds of 100 km/hour or more. The temperature within pyroclastic flows can reach 500° C or more. The picture below shows a ground hugging cloud of hot gases and ash (white arrow) rushing down the side of Mayon Volcano, Philippines, during an explosive eruption on 15 September 1984. What do geologists call a pyroclastic flow composed of hot gases and ash?

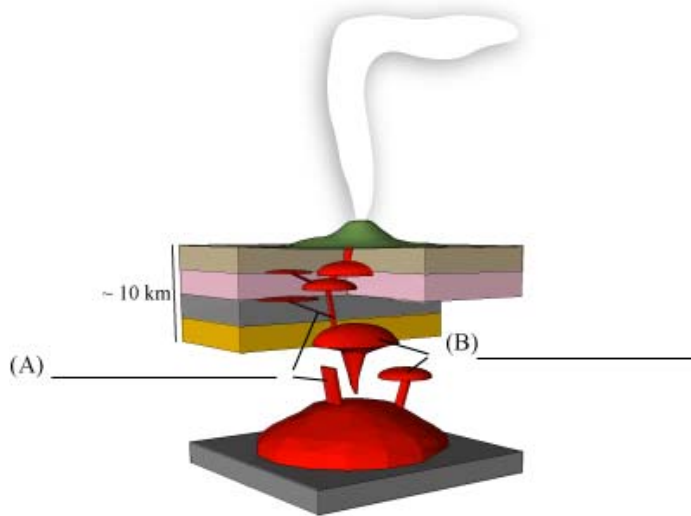


Photograph by C. Newhall, USGS, 15 September 1984

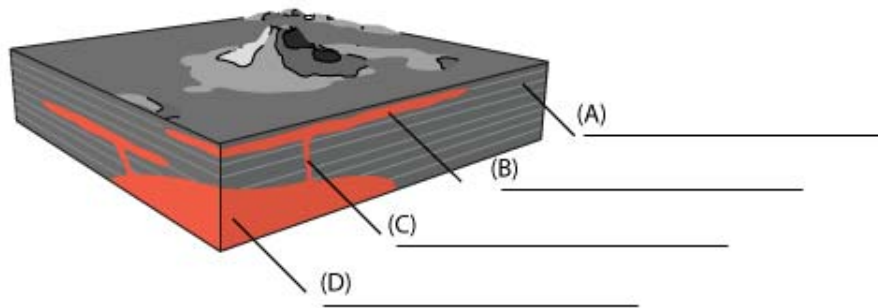
22. What would you call a particle blown out of a volcano if it ranges in size from 2 to 64 mm?
23. Any rock formed from a pyroclastic or ash flow is called an _____.
24. If particles are partially fused during the compaction of an ash or pyroclastic flow, then the resulting fused and compacted rock is said to be _____.

25. In the following list which term refers to silica content typical of peridotite (mantle rock)?
- (A) Ultramafic
 - (B) Mafic
 - (C) Intermediate
 - (D) Silicic
26. In the following list which term refers to igneous rocks with silica content typical of granite and rhyolite?
- (A) Ultramafic
 - (B) Mafic
 - (C) Intermediate
 - (D) Silicic
27. In the following list which term refers to the silica content typical of a basalt or gabbro?
- (A) Ultramafic
 - (B) Mafic
 - (C) Intermediate
 - (D) Silicic
28. In the following list which term refers to the silica content typical of an andesite or diorite?
- (A) Ultramafic
 - (B) Mafic
 - (C) Intermediate
 - (D) Silicic

29. In the following cut away view of the crust beneath an active volcano please fill in the missing labels for: (A) a tabular body of magma or its solidified equivalent that is discordant to layering in country rock, and (B) the general term for magma or its solidified equivalent.



30. In the following illustration please fill in the missing labels.



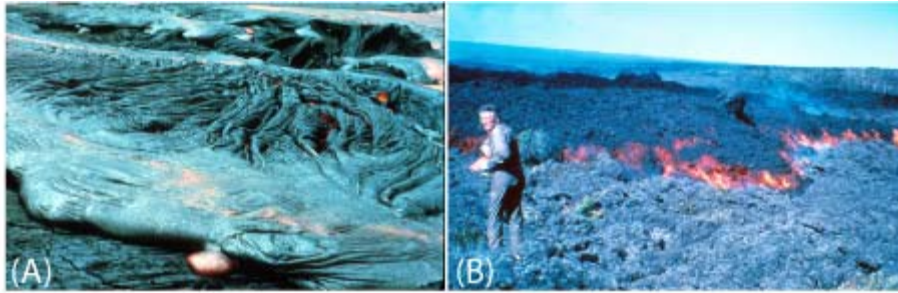
31. In the illustration for question 30, in nature, object D has a relationship to object C which in turn has a relationship to object B. What is that relationship?

32. How does a stock differ from a batholith?

33. How does a crater differ from a caldera?

34. Shield volcanoes always erupt voluminous quantities of _____ and are common in the _____.

35. Pahoehoe and aa are terms used to describe the surface morphology of lava flows. Which of the following photos features a pahoehoe flow and which features an aa flow?



Photos USGS (A) by R.L. Christiansen, February 12, 1972 (B) by P.W. Lipman, P.W., April 5, 1984

36. Are cinder cones generally larger or smaller than shield or composite volcanoes?

37. Composite or stratovolcanoes are steep sided and are composed of what compositional varieties of lava?

38. Below is an image of Mt. St. Helens prior to its eruption in May 18, 1980. What type of a volcano is Mt. St. Helens and along what type of plate boundary does it occur?



39. Below is an image of Mount Rainier, Washington. The image was taken from Tacoma by Lyn Topinka. According to the United States Geological Survey, Mount Rainier is an active volcano that erupted as recently as the 1840's. What type of a plate boundary does Mount Rainier occur along, and what kind of volcano does it represent?

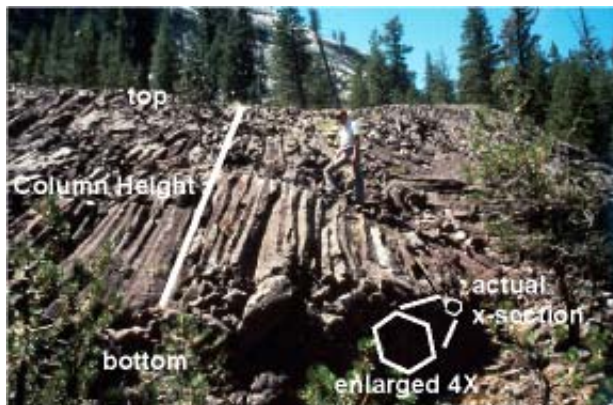


USGS USGS Photo by Lyn Topinka, August 20, 1984

40. Below is a map published by the USGS that shows the locations of major volcanoes along the western coast of the continental United States. Volcanoes in this chain form a _____ which lies above the subducted _____ microplate. Volcanoes in this chain are all _____ or _____.



41. What would you call the features illustrated in the following photograph? How did they form?



42. What would you call the following type of lava flow? Under what conditions do such flows develop? (elliptical feature with yellow-looking tag in center of photo is ~0.5 m across)



43. Pressure-release melting is a process that is thought to dominate beneath _____ and _____.
44. Dehydration reactions and the introduction of water to the mantle of the over riding plate play an important role in the production of _____ beneath volcanic arcs.
45. Partially melting mantle rock produces a liquid with a _____ composition.
46. In the following list, what item or items are not included in the Discontinuous Reaction Series?
(A) Olivine
(B) Pyroxene
(C) Amphibole
(D) Plagioclase
47. When a basaltic liquid first starts to crystallize the first mineral in the Discontinuous Reaction Series to form is
(A) Ca-rich plagioclase
(B) Na-rich plagioclase
(C) K-feldspar
(D) Quartz
(E) Olivine
48. When a basaltic liquid first starts to crystallize the first mineral in the Continuous Reaction Series to form is _____.
49. The last minerals to crystallize from a basaltic liquid in which crystal settling has played a role would be _____ and _____.
50. What is crystal settling?

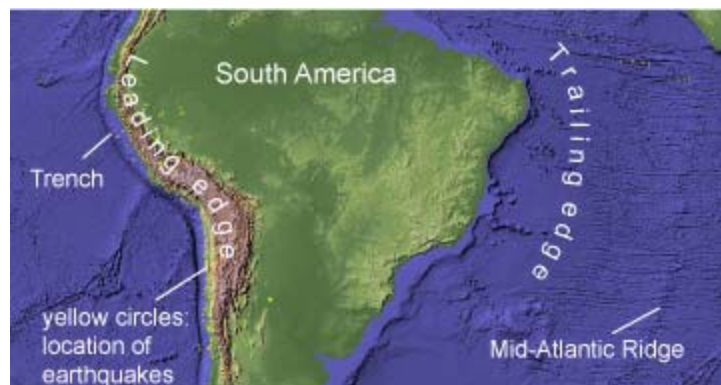
51. Basaltic magma can produce intermediate to silicic magma and lava through which of the following processes? Select one or more from the following list.

- (A) Assimilation
- (B) Magma mixing
- (C) Crystal settling
- (D) Shooting flow
- (E) None of the above

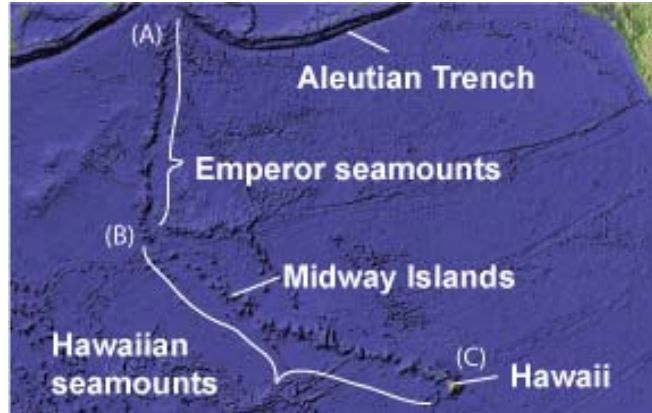
52. What two prominent types of igneous rocks would dominate the crust in the central part of the setting illustrated below?



53. What kinds of igneous rocks and land forms occur along the leading edge of the South American continent? Along the leading edge, what kinds of rocks would you expect to find at depth?



54. In the following illustration what does the Hawaiian-Emperor seamount chain represent?



55. In the illustration for question 54 which location, A, B, or C, contains the oldest, intermediate, and youngest volcanic rocks derived from hot spot volcanism?

56. In the illustration for question 54, what happened at location B?

Answers

1. magma
2. lava
3. magma
4. lava, pyroclastic
5. granite
6. basalt
7. diorite
8. phaneritic
9. aphanitic
10. porphyritic texture, (A) phenocrysts, (B) matrix
11. pyroclast or tephra
12. (A) bombs/blocks
13. Both bombs and blocks are similar in size. However, bombs typically have a spindle shape reflecting their origin as lava is aerodynamically streamlined as it moves through the air while blocks are angular reflecting their origin as solid pieces blown out of a volcano.
14. tephra or pyroclasts
15. tuff
16. 2, 64
17. 2
18. vesicles
19. Pumice is highly vesiculated siliceous volcanic rock while scoria is commonly highly vesiculated basalt.
20. obsidian
21. an ash flow
22. lapilli
23. ignimbrite
24. welded
25. (A) ultramafic
26. (D) silicic
27. (B) mafic
28. (C) intermediate
29. (A) dike, (B) pluton
30. (A) country rock, (B) sill, (C) dike, (D) pluton
31. the pluton fed magma through the dike to the sill
32. A stock is an intrusive igneous rock that has an exposed surface area of less than 100 km^2 while a batholith has an exposed surface area greater than 100 km^2 .
33. A crater has a diameter $< 1 \text{ km}$ while the diameter for a caldera exceeds this value.
34. basaltic, Hawaiian Islands
35. (A) pahoehoe, (B) aa
36. smaller
37. basalt to rhyolite
38. strato or composite volcanoes, converging margins
39. converging, strato or composite volcanoes
40. island arc, Juan de Fuca, strato, composite volcanoes

41. columnar joints, contraction as lava or shallowly emplaced magma cools and solidifies
42. pillow lava, lava flowing beneath water of glaciers
43. mid-ocean ridges and hot spots
44. magma
45. basaltic
46. (D) plagioclase
47. (E) olivine
48. calcium plagioclase
49. quartz, K-feldspar
50. Crystal settling is the process through which gravity pulls dense crystals to the bottom of a magma chamber
51. (A), (B), and (C)
52. basalt and gabbro dominate oceanic crust
53. Basalt to rhyolite flows and pyroclastic deposits make up numerous strato or composite volcanoes along the leading edge of the South American plate. At depth beneath the composite or strato volcanoes you would find gabbroic, dioritic, and granitic (or granodioritic) plutons.
54. the track of a stationary hot spot lying beneath the moving Pacific plate
55. Volcanic rocks at (A) are the oldest (~80 m.y.) and those at (B) are intermediate in age (42 – 50 m.y. old). Those at (C) are less than 2 m.y. old and include the active volcanoes of modern day Hawaii.
56. The direction of motion of the Pacific plate over the stationary hot spot changed from approximately northward to northwestward